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# Awareness, Attitudes, and Practices Related to Coronavirus Pandemic Among Public in Saudi Arabia

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New cases of Middle East Respiratory Syndrome Coronavirus (MERS-CoV) were reported in Gulf countries in 2014, and to date, it has reportedly infected 837 people and killed 291 globally. Awareness of an individual's knowledge and being able to predict his or her behavior is crucial when evaluating clinical preparedness for pandemics with a highly pathogenic virus. The aim of this study was to identify awareness, attitudes, and practices related to MERS-CoV among the public in Saudi Arabia. A cross-sectional study of 1147 adult subjects recruited from various shopping malls in Riyadh was conducted. All the subjects were interviewed using a questionnaire that tested their knowledge, attitudes, and use of precautionary measures in relation to the MERS-CoV pandemic. The majority of the participants showed high levels of concern and had utilized precautionary measures. After adjusting for other variables, gender was the only significant predictor of the level of concern ($P < .001$), while knowledge was the significant predictor of both the level of concern and precaution ($P < .001$). High concern translated into a higher compliance with precautionary recommendations. Frequent communication between health care providers and the public is recommended to help dispel myths about the disease and to empower the public with the information needed to help the Saudi government in containing the disease outbreak.
**Key words:** *awareness, MERS-CoV, Middle East Respiratory Syndrome Coronavirus, pandemic, Saudi Arabia*

NEW CASES of Middle East Respiratory Syndrome Coronavirus (MERS-CoV) were reported by health agencies in Gulf countries in August and September 2014. This threat of a potential pandemic has sent a new wave of fear in the Arabian Peninsula. As of July 23, 2014, MERS-CoV has reportedly infected 837 people and killed 291 globally.[1]

The exceptionally high fatality rate (>50%) subsequent to MERS-CoV infection coupled with the behavioral uncertainties of this

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*Khalid M. Almutairi designed, supervised the study, and led the data analyses. Eyad M. Al Helih led the data gathering and the manuscript writing. Mahaman Moussa assisted with writing the study. Abdulrahman Saleh Alajilan, Ahmad E. Boshaiqah, and Abdulaziz Almutairi assisted with the data gathering. Jason M. Vinluan led the data entry and assisted in data analyses.*

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novel virus has understandably caused major concerns.

The ongoing cases of MERS-CoV in the Arabian Peninsula that reported over the past 2 years have been surprising and difficult to explain. Furthermore, a clear mode of transmission of the infection to humans remains unknown. The actual risk posed by the MERS-CoV on public health is not yet fully known to the scientific community. The continued outbreak of new cases, the ongoing risk of transmission to humans, the reports of nosocomial outbreaks with transmission to health care personnel, and the increasing reports of cases imported outside the Arabian Peninsula raise a public concern.[2-5]

Middle East Respiratory Syndrome Coronavirus belongs to the genus *Betacoronavirus* and was first isolated in September 2012 in 2 Saudi patients with severe pneumonia.[6-8] It appears to replicate efficiently in human respiratory tissues targeting alveolar epithelial cells and the endothelium of blood vessels in the lung, indicating a potential for spreading beyond the respiratory tract.[9] Travel from the Arabian Peninsula has led to additional cases in over a dozen countries. Furthermore, 5 of the highest travelled airports in the world are located in countries where MERS-CoV has been transmitted, creating the possibility of a pandemic.[10]

It was reported that MERS-CoV outbreak was a result of multiple isolated transmission events, in addition to some human-to-human transmission.[8,11] Multiple sources of transmission were again identified in a study of the Hafr Al-Batin outbreak conducted by Memish et al,[2] with camels suggested as the most likely source. Another challenge was the identification of MERS-CoV in Saudi Arabia around the period of Umrah and Hajj pilgrimages in 2012 and 2013, yet no cases were reported in returning pilgrims either year.[1,12] Furthermore, active surveillance of symptomatic pilgrims in 2012 and 2013 failed to detect MERS-CoV infections.[2,13] In addition, no cases were reported by pilgrims, who travelled to Saudi Arabia to perform Umrah during July and August 2013.

With the reemergence of MERS-CoV in Saudi Arabia, the threat of airborne disease as a potential pandemic threat resurfaces. Considering the prevalence and incidents of MERS-CoV in the Kingdom of Saudi Arabia (KSA), misinformation about the virus sources, mode of transmission, and effective medical management, it became imperative to reassess the KSA infection control system and make appropriate recommendations before the MERS-CoV becomes a pandemic. The Saudi community understands too little about this virus when viewed against the magnitude of its potential threat. This lack of knowledge is alarming and the public health agencies must respond aggressively. Furthermore, it has been documented that understanding the perception of the public to infectious disease threats would contribute to the ability of the Ministry of Health (MOH) to determine knowledge gaps to be addressed in public health awareness campaigns. Saudi MOH has committed a lot of resources toward effectively containing the outbreak, preventing MERS-CoV, and promoting health through public education. Despite KSA MOH efforts calling for collective responsibility by the public health community in Saudi Arabia to raise public awareness toward this disease, more public involvement is needed. To the best of our knowledge, this is the first study in KSA, exploring the public awareness about MERS-CoV in KSA and making strong recommendations on effective strategies to get the community involved in MOH efforts to control MERS-CoV infection.

## METHODS

### Study subjects

Male and female Saudis and expatriates older than 18 years in shopping malls in Riyadh were consented to participate in the study.

### Study population and sampling technique

A number of large shopping malls that serve different geographical areas of Riyadh were

identified. Proportional quota sampling was used to ensure that respondents were demographically representative of the general population with quotas based on age, sex, work status, region, and social class. Qualified adults shopping in these malls between May 16 and May 30, 2014, who were willing to participate in the study were interviewed. Each data collector spent an average of 3 hours at each mall at randomly chosen times of the day to recruit participants. Of 1250 possible participants, 1147 subjects of both sexes were successfully interviewed (response rate = 92%).

### Data collection methods

An interview questionnaire was designed to collect the sociodemographic characteristics such as gender, nationality, age, education, and occupation of all participants. The other parameters were also included in the questionnaire such as Knowledge about the disease, its nature, mode of transmission, symptoms and signs, incubation period, period of communicability, and preventive measures. This knowledge was assessed by 16 factual statements that participants responded to with "yes" or "no." A scoring system was applied to assess the level of knowledge of each subject: 1 point was given for each correct answer. No point was given for an incorrect answer. Participants were grouped into three categories according to their level of knowledge: low (<10 points), average (10-12 points), and high (?13 points). Attitudes toward and perceptions of the disease, its severity, governmental efforts to combat it, and disease outcomes were assessed by 6 attitudinal statements that participants responded to with "strongly agree," "agree," "neutral," "disagree," or "strongly disagree." A scoring system was applied using the Likert 5-point scale; 5 points were assigned to "strongly agree," and 1 point was assigned to "strongly disagree." Negative attitude statements were scored from 1 (for those who strongly agreed) to 5 (for thosewho strongly disagreed). Thus, the total attitude score ranged from 6 to 30 points. For each statement, the participant was considered extremely concerned if he or she agreed or strongly agreed. Subjects were grouped into 3 categories according to their level of concern: extremely concerned (if agreement was evident for 5-6 statements), quite concerned (if agreement was evident for 3-4 statements), and little concerned (if agreement was evident for 2 or fewer statements). Each participant was asked to report the precautionary measures that he or she had been using during the epidemic to prevent infection. Participants' responses were assessed in accordance with the 6 precautionary measures recommended by the US Centers for Disease Control and Prevention. A scoring system was applied in which each participant was given 1 point for each precautionary measure taken. Thus, the total precaution score ranged from 0 to 6 points. A high level of precaution was considered to be 5-6 points, a moderate level was 3-4 points, and a poor level was 2 points or less.

### Data analysis

Data entry and statistical analysis were performed with the Statistical Package for Social Science software program for Windows (version 20.0). Descriptive statistics, such as percentages, means, and standard deviations, were calculated. Multiple regression analyses were performed to determine the significant predictors of both the level of concern and the level of precaution. Statistical significance was considered at *P* value of less than .05 for all analyses.

## RESULTS

### Sociodemographic characteristics

The baseline characteristics of the participants are presented in Table 1. A total of 1147 interviews were conducted (710 males and 437 females). Most of the participants were in the age groups of 18 to 24 years (40.9%) and 25 to 39 years (40.7%). The majority of participants were Saudi (83.7%). Nearly half of the participants were single (51.0%) and had completed their undergraduate education

**Table 1.** Demographic Characteristics of the Study Sample

| | Male (N = 710) | | Female (N = 437) | | Total (N = 1147) | |
|---|---|---|---|---|---|---|
| **Characteristics** | **No.** | **%** | **No.** | **%** | **No.** | **%** |
| Age group | | | | | | |
| 18-24 y | 294 | 41.4 | 176 | 40.3 | 470 | 40.9 |
| 25-39 y | 289 | 40.7 | 178 | 40.7 | 467 | 40.7 |
| 40-59 y | 108 | 15.2 | 80 | 18.3 | 188 | 16.4 |
| ≥60 y | 19 | 2.7 | 3 | 0.7 | 22 | 1.9 |
| Nationality | | | | | | |
| Saudi | 577 | 81.3 | 383 | 87.6 | 960 | 83.7 |
| Non-Saudi | 133 | 18.7 | 54 | 12.4 | 187 | 16.3 |
| Marital status | | | | | | |
| Single | 387 | 54.5 | 198 | 45.3 | 585 | 51.0 |
| Married | 308 | 43.4 | 221 | 50.6 | 529 | 46.1 |
| Widowed | 3 | 0.4 | 5 | 1.1 | 8 | 0.7 |
| Divorced | 12 | 1.7 | 13 | 3 | 25 | 2.2 |
| Educational level[a] | | | | | | |
| Noneducated | 18 | 2.5 | 10 | 2.3 | 28 | 2.4 |
| Less than secondary | 65 | 9.2 | 99 | 22.7 | 164 | 14.3 |
| Secondary | 233 | 33.8 | 105 | 24.0 | 338 | 29.5 |
| University | 340 | 47.9 | 187 | 47.8 | 527 | 46.0 |
| Higher | 54 | 7.6 | 36 | 8.2 | 90 | 7.8 |
| | | | | | $P < .001$ | |
| Employment status[a] | | | | | | |
| Government | 395 | 55.6 | 207 | 47.4 | 602 | 52.5 |
| Private | 285 | 40.1 | 220 | 50.3 | 505 | 44.0 |
| Retired | 5 | 0.7 | 1 | 0.2 | 6 | 0.5 |
| Unemployed | 25 | 3.5 | 9 | 2.1 | 34 | 3 |
| | | | | | $P < .001$ | |

[a]Significant.

(46.0%). Almost all participants (96.5%) were employed.

### Knowledge related to MERS-CoV

The overall knowledge related to MERS-CoV was reported in Table 2. The majority of the participants (91.6%) were aware that the disease was a viral illness; however, a large number also mistakenly believed that the disease was an immunodeficiency disease (48.9%). Most reported accurate information about the mode of transmission, although 43.9% stated that sexual contact was a possible mode of transmission. Of all participants, 79.8% agreed that the symptoms were the same as those of seasonal flu, although 48.1% of participants assumed that this illness could lead directly to death. More than half of all participants were not sure about their knowledge regarding incubation period (50.5%) or the period of communicability (36.5%). Regarding the MERS-CoV vaccination, 25.5% of participants believed that there was a vaccine available for the disease at the time of the survey, though it was not yet available.

### Level of concern

The majority of participants agreed that the government should isolate patients with MERS-CoV in special hospitals (86.2%),

**Table 2.** Knowledge About the Disease Caused by Coronavirus

| No. | Statement | Yes, % | No, % | Not Sure, % |
|---|---|---|---|---|
| The causes of the disease is | | | | |
| 1 | Virus | 91.6 | 3.8 | 3.8 |
| 2 | Immunodeficiency | 48.9 | 31.8 | 17.0 |
| 3 | Inherited disease | 18.5 | 66.0 | 13.2 |
| 4 | The disease is infectious and can spread from person to person | 83.7 | 7.1 | 8.0 |
| The disease is transmitted through | | | | |
| 5 | Droplets after sneezing | 90.6 | 3.9 | 4.6 |
| 6 | Touching and shaking hands with an infected person | 72.0 | 14.0 | 12.3 |
| 7 | The use of objects used by an infected person | 74.5 | 10.3 | 13.6 |
| 8 | Sexual route | 43.9 | 28.7 | 25.5 |
| What are the signs and symptoms of the disease? | | | | |
| 9 | Same as seasonal flu (fever; cough, sore throat, muscle ache, etc) | 79.8 | 6.6 | 12.6 |
| 10 | MERS-CoV could lead directly to death | 48.1 | 23.8 | 27.1 |
| 11 | The disease can be transmitted from human to camels and vice versa | 48.9 | 17.1 | 32.9 |
| 12 | MERS-CoV can be transmitted from animals other than camels | 26.2 | 28.0 | 44.9 |
| 13 | MERS COV can affect humans more than once in his life | 18.9 | 47.3 | 32.7 |
| 14 | There is a vaccine for MERS-CoV | 25.5 | 27.1 | 46.2 |
| How long does it take to appear the symptoms of the disease after the infection? | | | | |
| 15 | Less than 3 d? | 33.6 | 15.1 | 50.5 |
| After how many days can an infected person who was cured of the disease communicate with other recovering? | | | | |
| 16 | Immediately | 43.6 | 19.3 | 36.4 |

Abbreviation: MERS-CoV, Middle East Respiratory Syndrome Coronavirus.

reduce the numbers of arrivals to Hajj and Omrah (70.3%), and be prepared to close schools if the number of cases increases dramatically (77.4%), while 48.3% of participants believed that the government should restrict travel to and from areas where large numbers of people were infected with the disease. On the contrary, 40% of the participants preferred not to travel during the epidemic and chose to stay at home (35.5%) (Table 3).

### Precautionary measures

The majority of participants reported frequent handwashing (94%), and the use of face masks in crowded areas (74.9%). Moreover, most participants reported avoiding touching their eyes, noses, or mouths (81.3%), and covering their noses and mouths with a tissue when coughing or sneezing (90.7%). In addition, the majority of participants reported throwing the tissue in the trash after use (93.6%) and avoiding normal activities when they had flu-like symptoms (72.2%) (Table 3).

Table 4 shows multiple regression analyses of the concern scores and the precaution scores in relation to several independent variables. Gender was the only significant predictor of concern ($P < 0.001$), whereas knowledge was a significant predictor for both concern and precaution ($P < .001$).

**Table 3.** Responses (%) of Participants to Concern Statements and Self-Reported Precautionary Measures Against MERS-COV

| Statement | No. | % | 95% CI |
|---|---|---|---|
| Concern | | | |
| We should avoid leaving our homes nowadays | 407 | 35.5 | 30 ± 41 |
| If I decide to travel, MERS-COV may prevent me from travelling | 458 | 40 | 38 ± 43 |
| The government should restrict travel from and to the areas of the disease to avoid spread of disease | 554 | 48.3 | 43 ± 53 |
| The government should isolate infected patients in special hospitals | 989 | 86.2 | 83 ± 90 |
| The government should reduce the numbers of arrivals to Hajj and Omrah | 806 | 70.3 | 67 ± 73 |
| The government must be ready to close schools if the number of cases increases | 888 | 77.4 | 76 ± 79 |
| Precaution | | | |
| I wash hands often | 1078 | 94 | 91 ± 98 |
| I avoid touching the eyes, nose, and mouth | 932 | 81.3 | 76 ± 86 |
| I cover my nose and mouth with a tissue when coughing or sneezing | 1040 | 90.7 | 86 ± 95 |
| I throw the tissue in the trash after I use it | 1074 | 93.6 | 89 ± 98 |
| I use face mask to cover my nose and mouth in crowded places | 859 | 74.9 | 70 ± 80 |
| If you have flu symptoms appeared, I avoid normal activities such as going to work for school, travel, shopping . . . . etc | 828 | 72.2 | 67 ± 78 |

Abbreviations: CI, confidence interval; MERS-CoV, Middle East Respiratory Syndrome Coronavirus.

**Table 4.** Multiple Regression Analysis of Degree of Concern and Precautionary Measures on Some Independent Predictors

| Independent Factors | B | SE | *t* | *P* |
|---|---|---|---|---|
| **Age** | | | | |
| Concern | 0.01 | 0.01 | 0.08 | .93 |
| Precaution | − 0.01 | 0.08 | − 0.01 | .99 |
| Gender | | | | |
| Concern | 0.13 | 0.02 | − 4.42 | <.001 |
| Precaution | − 0.03 | 4.15 | − 0.97 | .33 |
| Marital status | | | | |
| Concern | 0.01 | 0.01 | − 0.03 | .99 |
| Precaution | − 0.05 | 0.06 | − 0.08 | .93 |
| Education | | | | |
| Concern | − 0.35 | 0.01 | − 0.97 | .33 |
| Precaution | − 0.02 | 0.08 | − 0.04 | .96 |
| Employment status | | | | |
| Concern | − 0.32 | 0.01 | − 1.10 | .27 |
| Precaution | 0.04 | 0.04 | −015 | .87 |
| Knowledge | | | | |
| Concern | 0.35 | 0.08 | 0.26 | <.001 |
| Precaution | 0.28 | 0.02 | 10.11 | <.001 |

## DISCUSSION

The present study demonstrated that the occurrence MERS-CoV infection had an emotional impact and also increased people's attention to preventive measures and their knowledge about the necessity of early access to health care. Information and education delivery need to take into account the local conditions and the population.

Many studies have examined the various levels of knowledge, attitudes, and practices about infectious disease outbreaks, such as severe acute respiratory syndrome, avian influenza, and the influenza strain H1N1.[14] But a literature search has not found any public reports on knowledge regarding coronavirus among the population in Saudi Arabia until now. Therefore, this population-based survey could provide baseline data to government for preventive measures in case of future outbreaks.

In a previous study designed to assess the Hajj pilgrims' knowledge about MERS-CoV, researchers found that the majority of participants were aware of an ongoing MERS epidemic in Saudi Arabia and of the Saudi MOH recommendations for at-risk pilgrims to postpone performing the Hajj in 2013.[15] In our study, majority of participants were aware of an ongoing coronavirus situation in the country.

Unless people have basic knowledge about the modes of transmission and availability of vaccines, they respond appropriately during an outbreak.[16] In the present study, many participants had low knowledge with regard to the period of communicability (43.6%), the incubation period (33.6%), and availability of vaccine (25.5%).

Our study showed a higher level of proper hygienic practices among participants. Ninety-four percent of the participants reported washing hands regularly; more than 90% reported using respiratory etiquette measures. These implied that precautionary activities in avoiding infection by coronavirus need to be encouraged and strengthened.

An important finding from this study is that high concern was prevalent in many participants although it took different forms. The majority of participants agreed that the government should isolate patients with coronavirus in special hospitals (86.2%), avoid inviting workers from areas where the disease is prevalent, restrict travel to and from such areas (48.3%), and be ready to close schools if number of cases dramatically increases (77.4%). More than one-third of participants preferred not to travel during the epidemic and chose to stay at home instead.

Multiple regression analysis identified predictors of participants' concerns and precautions. The results indicate that gender was the only significant predictor of concern, whereas knowledge was a significant predictor for both concern and precaution. Thus, educational programs conducted by health care providers might be effective, but the attitudes of local community must be taken into consideration when planning health education in communities with MERS-CoV.

Awareness of MERS-CoV in neighboring areas can cause panic in the community. However, it can also contribute to early health care–seeking behavior. Providing information from experiences of occurrence of patients with MERS-CoV and community preparedness are crucial if further pandemics are to be prevented. Periodic educational interventions using locally adjusted methods could contribute to preventing panic, encouraging people to access health care early, and reducing infection and mortality.

## CONCLUSION

This MERS-CoV epidemic has not caused public panic yet, but the knowledge of MERS-CoV in public is not optimal. Public education campaigns may take scientific facts into account. The data collected in this survey could be used as baseline data to monitor public perception and behavior in the event of a future outbreak of infectious diseases in Saudi Arabia. Perhaps increased communication between physicians and the public would help dispel myths about the disease and help spread accurate information about the role that the public can play in limiting the spread of the disease. Collaborative efforts orchestrated by the MOH are needed and should focus on public education and training through media resources.

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